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Criterion, construct and predictive validity of computerised respiratory sounds in COPD.

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Aim: Computerised respiratory sounds (CRS) are simple measures, closely related to the movement of air within the tracheobronchial tree and thus, promising outcome measures to be used in primary care practice to assess patients with chronic obstructive pulmonary disease (COPD). However, CRS measurement properties, such as validity, have been poorly tested. This study aimed to assess criterion, construct and predictive validity of CRS in COPD.

Method: Fifty patients (36 males; 67.26±9.31y, FEV_1 49.52±19.67%predicted) with stable COPD were enrolled. CRS at anterior and posterior right/left chest were simultaneously recorded and the number of crackles, wheeze occupation rate, median frequency and maximum intensity were processed using validated algorithms. Spirometry-lung function, a numerical scale-cough and wheezing intensity, modified medical research council (mMRC)–dyspnea and the COPD Assessment Test (CAT)-impact of the disease, were also applied. Receiver operating characteristic (ROC) analysis, Spearman's rank correlation coefficient and multivariate Cox regression analyses were used to assess CRS criterion, construct and predictive validity, respectively.

Results: Inspiratory number of crackles were the only CRS parameter exhibiting adequate criterion validity to differentiate between patients with mild-to-moderate from patients with severe-to-very severe airflow limitation (areas under the curve > 0.78; p=0.001). Cutoff points were of 0.1 (sensitivity=81%; specificity=71%) and 0.5 (sensitivity=74%; specificity=80%) for right and left chest, respectively (Fig.1). Concerning construct validity, significant low correlations (r_s<0.48; p<0.05) were found between cough, wheezing, mMRC and CAT with CRS parameters. None of the CRS parameters were predictors of the time until the first exacerbation (p>0.05; hazard ratios between 0.95 and 1.04).

Conclusion: CRS, namely inspiratory crackles, showed adequate criterion validity to be used as part of the evaluation of patients with COPD. However, analogously to other clinical outcome measures, such as lung function, CRS significantly differ from patients' experiences of the disease. Hence, CRS should not be used isolated in patients' assessment.

Declaration of Interest

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